Report on Previous Remote Operations Workshops & REAP Working Group

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CoToGAN 2003

October 29-31

Trieste, Italy

GAN/RemOp Reports & Workshops

Two ICFA commissioned reports and 2-1/2 workshops on GAN and Remote Operations:

- 3/00 - 12/01 ICFA Reports –
  1) General considerations of implementing a GAN,
  2) Technical considerations – design & cost

  www.fnal.gov/directorate/icfa/icfa_tforce_reports.html

- Workshops –

  3/02 (Cornell) Enabling the GAN

  www.lns.cornell.edu/ganwkshp

  8/02 (Berkeley) Collaboration Tools for the GAN

  www-itg.lbl.gov/Collaboratories/GANMtg

  9/02 (BNL/Shelter Is.) Remote Operations Workshop

  www.agsrhichome.bnl.gov/RemOp/

ICFA Reports

2 sub-groups:

1. General considerations (M. Astbury)

How to maintain active interest
Development areas
Cooperation, decision taking, project mgt, …
Organizational framework

2. Technical considerations (F. Willeke)

What activities can be done remotely?
Local staff requirements for ops, maintenance, repairs
Hardware design changes for remote diag. & analysis
Bandwidth requirements / communication technologies
Sociological problems of worldwide decentralized ops
New technical tools to be developed

ICFA Task Force - Conclusions

Overall summary (LC context):

"Remote operation of a large new accelerator will be challenging, but so will most other aspects of such a facility."

Sub group 1:

- Number of funding sources kept to minimum
- Review experience of detector collaborations
- HERA, LHC good examples of international collaboration
- ESRF example – France & Germany commitment a critical step
- Best accel. performance from close teams oper., engr., accel ph.
- GAN can work with single lab or international lab
- Host or nearby lab remove "green field" disadvantage

ICFA Task Force (concl.)

Sub-group 2:

- Many accelerators presently use "remote" operation – "far remote" operation likely feasible.
- 100-200 people on site – accelerator control fully decentralized
- Videoconferencing essential – shift change, planning, status
- All control rooms identical, visible and transparent
- On-site supervision for safety – technical issues solvable, but legal and regulatory issues a challenge.
- All normal activities could be controlled remotely – "any facility with adequate diagnostics and controls for efficient operation could easily be commissioned remotely."
- Estimate experts require for 1% of failures (<20 / year)
- Spontaneous, informal communications essential (A-V comm.)
- Primary technical challenge of future accelerator is in large number of components – additional cost of remote ops negligable.

GAN/Remote Operations Workshops – an Overview

With the stage set, expanded participation by the accelerator community was needed.

Two workshops were set up in 2002 as joint effort by BNL, Cornell, & DESY –

- Enabling the Global Accelerator Network (March)
  - First effort of the community to define "GAN"
  - Realization of extent of cultural differences
- Remote Operations Workshop (September)
  - Focused more on experience, communications, operations, & engineering design for remote operations.
  - First substantial involvement of control room operations people

GAN/Remote Operations Workshops – Overview (2)

A third, one day workshop took place in August.

- Collaboration Tools for the Global Accelerator Network
  - Joining of accelerator and collaboratory communities
  - More emphasis on collaboration tools and social science

Cornell workshop

Overview:

- 2-1/2 day workshop, ~1/3 plenary, 2/3 working groups and summary
- 39 attendees from US, Germany, England, France, Japan
- I.T., nuclear, particle, and accelerator physics communities represented
- Sociological aspects of GAN & remote operations most challenging

Cornell – Working Groups

WG1 – Elements of a Global Control System

What are critical aspects of a world-wide control system

WG2 – Tools for Implementing Control Systems

What tools are needed for a GAN in LC context?

WG3 – Communication & Community Building

With emphasis on organizational and sociological aspects of a global accelerator.

Cornell – Working Group 1

WG-1 "Elements of a Global Control System"

Key questions for discussion

- 1% problem
- Controls Architecture Considerations
- Better diagnostics (covered in 1% problem)
- Organization of maintenance and spares
- Operator training

Cornell – 1% Problem

Extrapolating from existing machines, on about 20-occasions/year experts presence on site may be required. For a GAN type of machine this would probably mean an interruption of operations of at least 2 days in each case when extended air travel is involved.

Possible Remedies:

- Improve internal diagnostic
- Extensive self checking
- Reliable engineering concepts
- Extensive logging
- Precise event time stamping
- High time resolution logging
- Local hands and eye of expert
- Every Problem investigated/doc.
- Emphasize remote diagnosis
- Complete function checklist
- More formal handling of all actions, examples in industry
- Follow-up, error documentation, error statistic: reliability officer
- Environmental awareness monitors (noises, vibration, smell, humidity, environmental temperature)

None of these too $$; All desirable for large non-GAN machine.

Cornell- Controls Architecture

Topics Considered:

- What are the main arguments for local versus distributed computing (thick versus thin client)
- Do the remote control rooms really have to be identical
- Will comprehensive system simulation play a major role in software development, testing, trouble shooting maintenance and development?
- Is there a need for a global control system (uniform across accelerator)

Cornell – WG1 (cont.)

Maintenance & Spares

- Faulty components shipped back to source for repairs?
- Increase spares inventory?

Operator Training

- Common operator training
- Simulation systems need work
- Logging/playback of incidents potentially useful
- Mixing operator teams between labs

Standardization vs. Accommodation

- How far through system must standards be imposed?
  - Uniformity →lower cost, better maintainability, less confusion.
  - Accommodation →more flexibility for designers - can stick with well known systems, more feeling of ownership
- Standards committee needed early in planning stage
  - Uniform standards where possible
  - 3 worldwide regions intensify challenge
  - Language, software development, documentation, testing, QA standards all needed.

Cornell – WG1 (concl.)

Misc. topics

- Why GAN not considered for ATF (Japanese perspective)
- Virtual GAN proposal (Project seems ambitious at this time)
- Review of GAN tasks, devel. stage, priority
- Must make clear what GAN means.
  - Many participants developed view during workshop.

Cornell – WG-2

WG-2 "Tools for Implementing Control Systems"

- Focus on tools for GAN
- Most problems of GAN similar to any large scale accelerator project.

Cornell – WG-2 (cont.)

Conclusions:

- There are no fundamental technical difficulties with creating a GAN
- The users' needs have a strong impact on choice of tools.
- Workshop was useful – discussions should be continued.
- Working groups' results intertwine
- Steering body needed for standardization-accommodation issues.
- Broadening the degree of desirable standardization will increase accommodation to the community.

Cornell – WG-3

WG-3 "Communication and Community Building"

- How to achieve a common vision & goal?
  Do we share the same goals & purposes and what are they?
- Why would **site** laboratory relinquish control?
  Must we break the symmetry by having a site laboratory?
- What are possible organizational structures?
  Proj. mgmt centralization, computer security, building & oper. accel.
- How to build and sustain trust and relationships?
  Face-to-face vs. remote with A/V tools
- How to motivate long term involvement?
  Maintain excitement and commitment over project life cycle.

Cornell – WG-3 (concl.)

WG-3 "Communication and Community Building"

- What are differences between experiments and accelerators?
  Experiments have history of geographical extension, accelerators focused at a single location.
- What is the remote operations community?
  How is operations group constructed? Role of multiple control rooms in maintaining accelerator technology centers?
- What are foundation technologies & infrastructures needed for communication & community building?
- What language do we use?
  How to establish required glossary of terms?
- What is the process to answer these questions?
  Prototype GAN projects? How to prepare for future workshops?

Berkeley Workshop

Overview:

- 1 Day workshop – single session talks & discussion
- 18 attendees from US, Germany, Switzerland
- I.T., social science, particle, and accelerator physics & operation communities represented
- User-centered design process employed in the afternoon

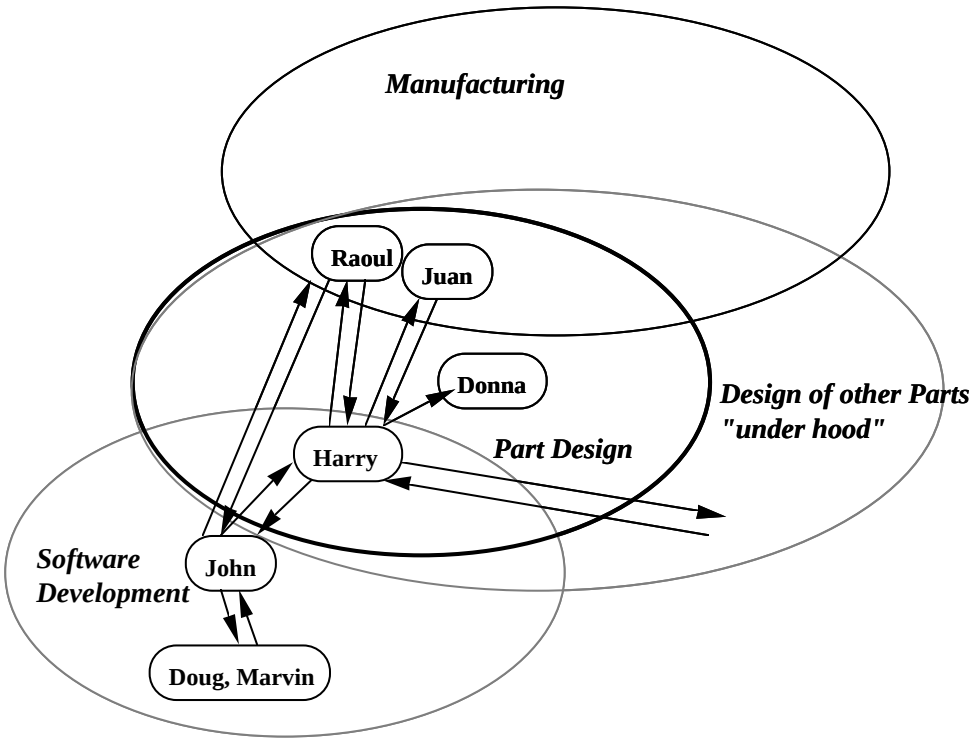
  A few representative scenarios were used to study the communication flow and coordination activities – then discussion of collaboration technologies capable of supporting work.

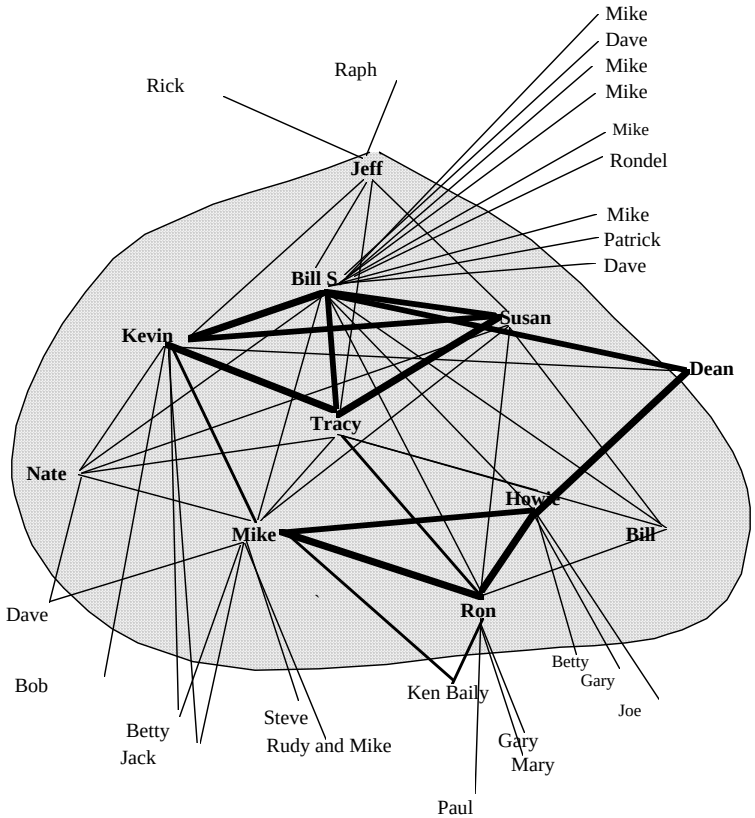
Berkeley -

Topics:

- **Collaboration Technologies**
  Instant messaging, video conferencing (→Access Grid), shared displays, ptp file sharing, conversation databases, electronic notebooks/logs, shared calendars, Grid technologies
- **General GAN Observations**
  communications activities for accelerator operations,
  social factors – trust & motivation
  approach – emphasis first on social factors, then technical
- **Prospective (prototype) GAN Scenarios**
  TTF2, RHIC/SNS, LHC
- **User-centered Design**
  "When users' goals & work are understood, the functionality of the new system can be defined, built, and tested with end users."

Berkeley – User centered design



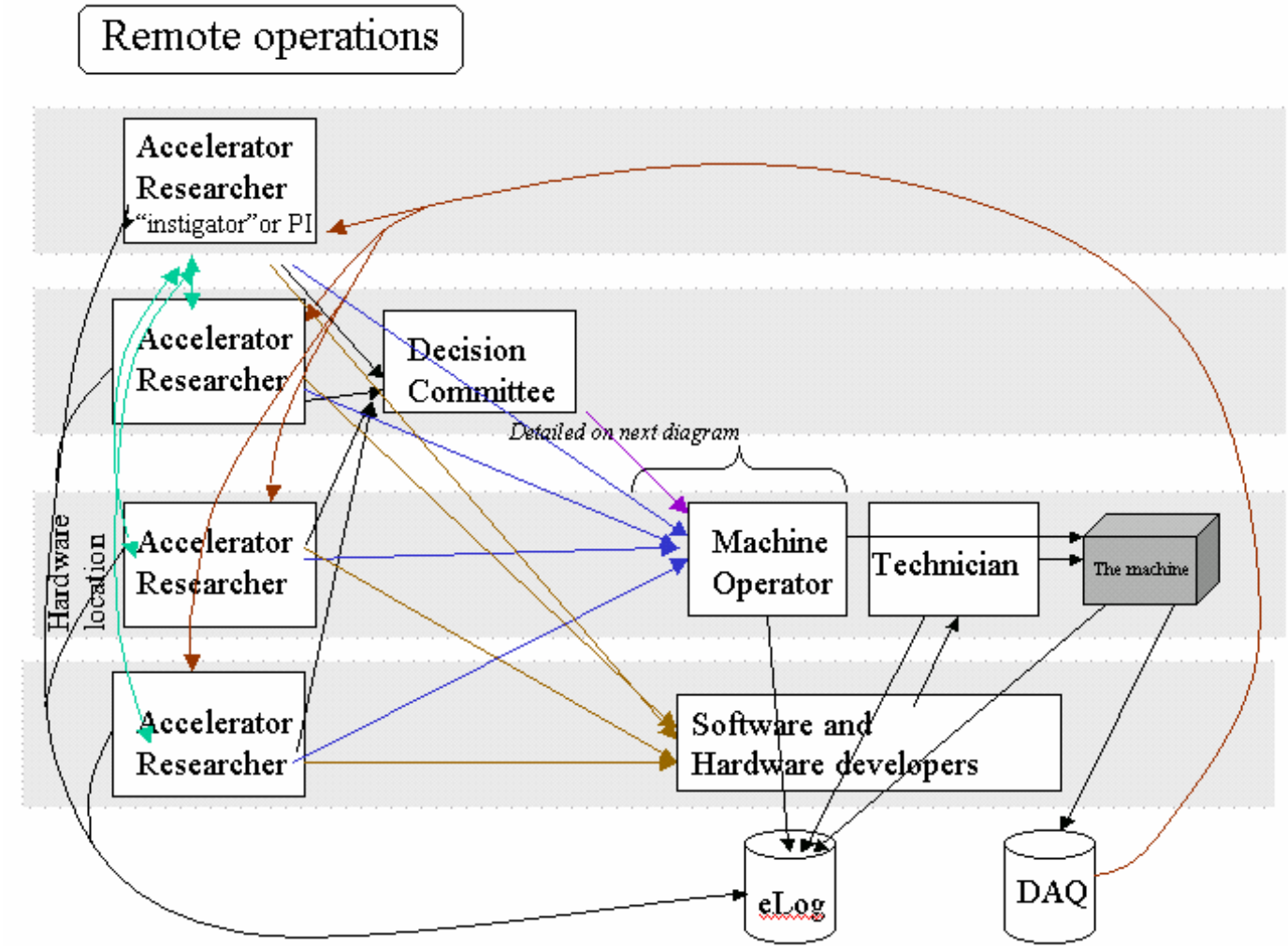


People & Major Contacts

Communication Levels In and Out of department

Berkeley – User centered design

Phases of remote operation of the accelerator.



Shelter Is. Workshop (BNL)

Overview:

- 3-1/2 days, <1/3 plenary session, >2/3 working groups & summary
- 48 attendees from US, Germany, England, Japan and Russia
- I.T., social science, particle, and accelerator physics and operations communities represented
- More emphasis on operations than previous workshops.

Shelter Is. – Working Groups

WG1 - Experimental and Accelerator Demonstrations

Evaluate concrete examples of R.O. demonstration projects

WG2 - Communication & Operations Communities

Explore scope of R.O. solutions, social & collaborative aspects

WG3 - Engineering Designs for Remote Operations

Will presently designed hardware perform w/o experts on site?
What on-site engineering expertise is required?

WG-1 "Experimental and Accelerator Demonstrations"

- What is GAN?
  Remote operations for most of runs ⇔ remote modeling /diagnostics by experts supporting operation
- GAN-Oriented Console
  A/V, whiteboard, chatting, GUI environment, elog/doc access, compatibility across collaboration, version control, bandwidth
- Table of Experiments
- Benefits of GAN-oriented R&D for existing accel.
  Improved access to data/equipment; Knowledge exchange; GAN console as education tool; Analysis for GAN feeds back to operations/management procedures

WG-2 "Communication & Collaborative Tools"

- **Operations Issues**
  Activities & communications taking place; shift turnover; operator workplace issues (qualifications, benefits, cameras)
- **Security Issues**
  Action items: Ownership; Strategy; Organization
- **Social Issues**
  Privacy: back channel comm., elog access. **Reciprocity:** no 1-way A/V
  Trust; "Rules of the Road"; Culture; Adoption to GAN culture;
  Training, Informal meetings ("water cooler conversations")
- **Compare operations styles/procedures**
  FNAL, SLAC, KEK, DESY
- **Tools**
  Access Grid, white boards/smart boards, VRVS, chat, e-notebooks

WG-3 "Engineering Designs for Remote Operations"

- **Operations Engineering Model**
  Maintenance models, number & types of on-site personnel, access to experts.
- **Design Engineering Models**
  Modular design, standard instrument modules, built-in redundancy, new standard modules (1 voltage, serial I/O, self ID, etc), self diagnosis
- **Systems Integration & Operations Support**
  Level of help needed for integration & commissioning; documentation; systems maintenance requirements
- **Lines of Responsibility & Authority**
  Diffuse organization adds problems

Shelter Is. – WG-3

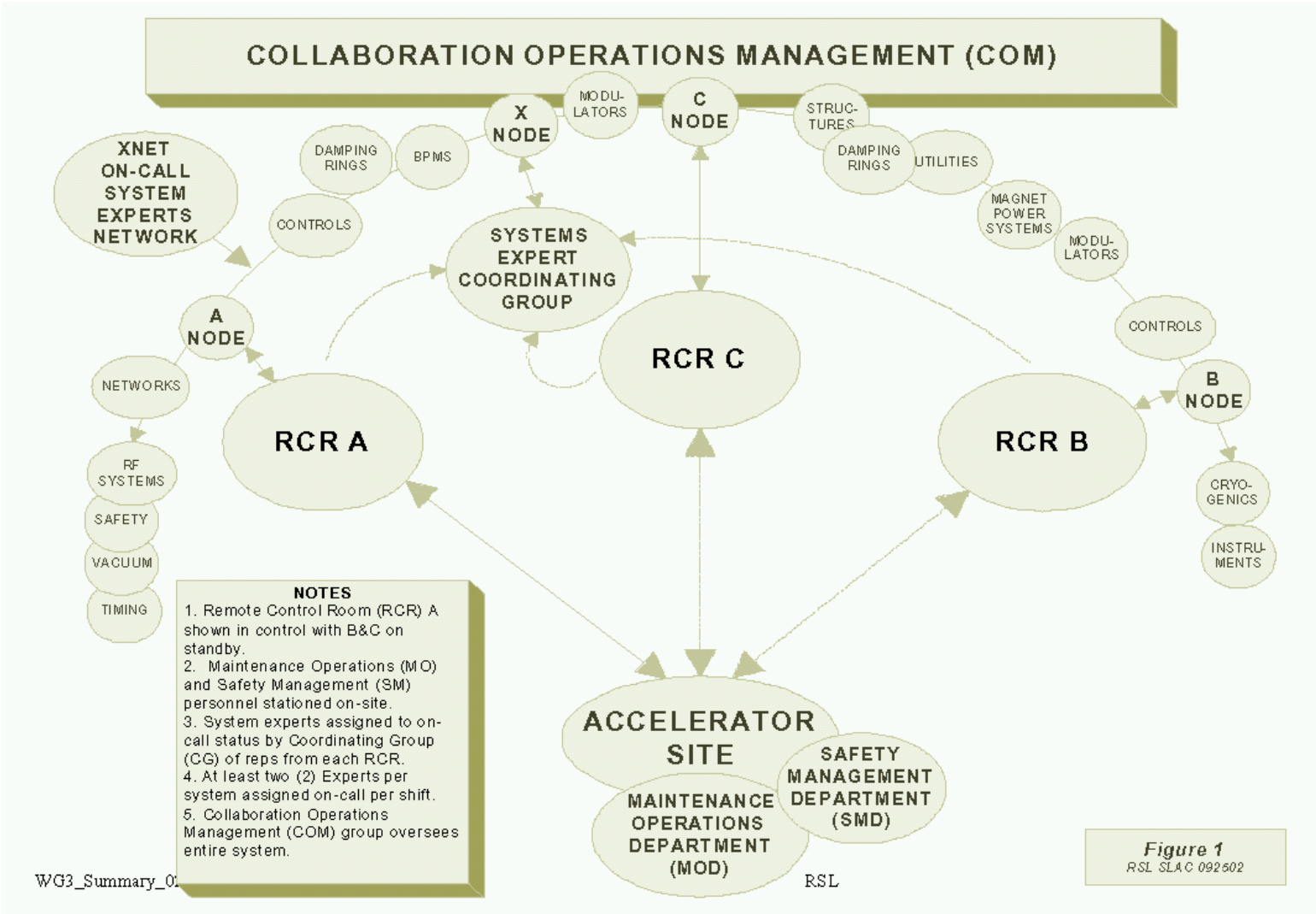


Figure by Ray Larson (SLAC)

REAP Working Group

The Remote Experiments in Accelerator Physics working group was approved by ICFA to function under the Beam Dynamics Panel in February, 2003.

Mission Statement:

- **To promote collaborative accelerator physics experiments carried out using the evolving techniques of remote operation. It is intended that web based communication and collaborative decision making will be an important part of the effort.**

23 initial members from (primarily HEP) accelerators worldwide. Primary responsibility is to function as liaison between lab and working group.

REAP WG Activities

- Web page to disseminate information
  - www.lepp.cornell.edu/icfa/reap/
- Database of Remote Ops/ AP experiments
  - F. Pilat - www.c-ad.bnl.gov/RemExp/default.asp
- Support of workshops on Remote Operations
- Reporting of activities in BDP newsletter
- Development / promoting of webcast seminars for accelerator physics
  - Accessible Webcast Seminars (under devel. at Cornell)
  - VRVS

Accessible Webcast Seminars

Objective: Develop system to webcast seminars using readily available technology with emphasis on accessibility by largest possible potential audience.

- Use personal computer with normally available programs (web browser, Real Media streaming client, email)
- Accessible from home for seminars from different time zones.
- Feedback mechanism to pose questions to speaker